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**Dates:** Received: 16 August, 2017; Accepted: 11 September, 2017; Published: 13 September, 2017

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**Keywords:** Occupational traumatism; Women; Members of vessel's crew; Transport fleet; Northern water's basin

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## Research Article

# Features of Occupational Traumatism among Women from members of Vessel's Crew of transport fleet of the Northern Water's Basin

## Abstract

The use of women's labor in water transport is limited due to the specifics of production processes on vessels, the duration of flights, isolation from shore bases and families. Among the total contingent of members of vessel's crew, women make up 10.7% - on transport marine up to 34.4% - on river transport vessels.

The analysis of traumatism affecting women was based on 134 cases, which happened on board of vessels resulting in a temporary loss of ability to work. The control group consisted of 2,082 injuries, received under the same conditions by men.

In contrast to men in women with occupational injuries on vessels, bone fractures of different localization are much less common in comparison with, bruises and wounds. However, due to the specifics of the work performed, women receive, in comparison with men, more severe burn injuries with an area of damage of 5.0-20.0%, mainly the shin, face, chest, forearm.

Occupational damages in women from members of vessel's crew make up require more frequent primary surgical treatment of damages on board than for men. At the same time, they require hospitalization and surgical interventions in the hospital departments of hospitals 1.8 times less often than men.

Occupational traumatism among women from members of vessel's crew of the sea and river transport fleets are characterized by a favorable current. The number of complications with them is 4.4 times less than in men.

## Introduction

The use of women's labor in water transport is limited due to the specifics of production processes on vessels, the duration of flights, isolation from shore bases and families. Among the total contingent of members of vessel's crew, women make up 10.7% - on transport marine up to 34.4% - on river transport vessels.

Long flights, high demands homeostatic systems of the female body, causing a variety of changes in the functioning of vital organs and systems, until the development of pre-morbid and pathological conditions. Work on water transport leads to specific changes. In women, floating on the vessels, there was a trend to a reduction in menstrual cycle and increase the duration of bleeding. At the medical examination of women from members of vessel's crew of sea and river transport fleet

of the Northern Water's Basin of dispensary groups was as follows: healthy - 84.6%; practically healthy - 12.8%; offset by - 2.6% [1-3]. After being on board on vessels of women during for one year their health is estimated as good at - 56.5%; Satisfactory - 38.0%; Weak - 5.5% [4]. Women in the workplace behave more cautiously than men, but such behavior is not in itself a prevention of traumatism [5,6].

Transportation is carried out on river and sea vessels. The northern water basin is one of the largest in length and complex in terms of navigational conditions. It covers the basins of large rivers: the Northern Dvina, Pechora, Mezen and Onega. The river transport fleet provides delivery of economic goods to the regions of the Komi Republic, Nenets Autonomous District, the Arkhangelsk, Kirov and Vologda regions of the Russian Federation. In most of the served areas, river-based floating facilities are the only mode of transport for bulk cargo,

so their role is extremely important for sub-Arctic territories. In addition to intra-basin transportation, cargo is transported on mixed river-sea vessels to Murmansk, Naryan-Mar, Mezen, Onega, Baltic, Volga, Kama and Don ports. Navigation on the rivers in the northern water basin takes place in unusual meteorological conditions. Spring opening of rivers can occur earlier than usual and at lower horizons. This imposes additional difficulties for the organized deployment of freight forwarding cargo in the lateral and rapidly desiccating rivers and towing the winter rafts. After a flood, a rapid drop in the water level may occur below the critical marks, as a result of which the period of operation in the lateral rivers is reduced by 6-8 days.

## Materials and Methods

The analysis of traumatism affecting women from members of vessel's crews working in sea and river transport fleets of the Northern Water's Basin was based on 134 cases, which happened on board of vessels resulting in a temporary loss of ability to work. The control group consisted of 2,082 injuries, received under the same conditions by men.

The volume of emergency medical care is determined by the nature and severity of injuries to women. In the treatment, conservative methods were predominantly used. Operative methods often used surgical treatment of wounds and injuries than other types of surgical interventions. Evacuation of victims to shore medical institutions was carried out taking into account the principles of staged treatment.

It was analyzed data obtained on the basis of medical documentation, namely:

- a) regular reports written by the vessels' medical staff;
- b) vessels' medical journals;
- c) medical files of the discharged patients;
- d) fragments of patients' medical records;
- e) medical records of the patients;
- f) reports on causes of temporary disability;
- g) occurrences of accidents happened on board of vessel.

While working on these documents, the following methodological approaches were used: systematic, comprehensive, integrative, functional, dynamic, process, regulatory, quantitative, administrative, and situational. Methods of comparison were also employed such as grouping, comparison of absolute and relative values, averaging, continuous observation, and generalization. Statistical processing of the obtained results was carried out using methods of variational statistics.

## Results

In the overall structure of occupational traumatism of members of vessel's crew of the Northern Water's Basin for women traumas was 6.0%. The frequency of accidents among women (90.2 per 1,000 employees) was 1.8 times less than

men (162.4). This marine transport vessel, it was significantly higher (113.9) than the river ones (71.2). The average age of women who are injured on the vessels, was six months longer than men, and was thirty-one and a half year. Young women enrolled in members of vessel's crew of up to 20 years, received the same injuries often as men (9.0 and 8.8 respectively). At the age of 20-29 years, 30-39 years and 40-49 years, the number of women's traumas have 1.8 - 4.2 times smaller. At the same time, developed by women while swimming on vessels skills proved stronger than men. However, practice has shown its superiority to men only as long as they operate in the standard operating conditions. In cases of complication of working conditions, unforeseen circumstances and, in particular, extreme conditions, safety and security of women's labor is greatly reduced in comparison with men. As with the transition into the senior age group of women in parallel there is a sharp decline in the functional capacity of adaptation of the whole body due to hormonal changes, the frequency of the victims in the age group over 50 years among women is 1.6 times higher than that of men.

Female labor on sea and river transport vessels is represented by several specialties. Among the women with occupational traumas, 75.6% of the victims were representatives of services of household and 24.4% - of operation of the vessel: cooks, bakers 44.4% (39.8%), barmaids, bakeries - 31.3% (28.0), sailors - 13.3% (13.4) and skippers - 11.2% (9.0). With the increase in professional experience, the level of traumatism among women consistently declines from 26.7 cases for female workers with an experience of up to 1 year to 1.5 - with experience from 10 to 15 years. An increase in the frequency of traumas is associated with the development of processes of violation of adaptation of the female organism to vessel's conditions, long flights and severe climatic conditions of the northern region. On water transport, most injuries with women occur during work: in the galley (33.9); related to movement along the ramps and decks (25.2); service of the crew (7.4). The nature of the work performed by them on vessels, explains the characteristics of damaging agents. In comparison with men in women, traumas are twice as likely to be inflicted on sharp objects. They did not experience any injuries in alcoholic intoxication, while 8.7% of men got injuries after using ethanol. The accumulation of fatigue during the weekly cycle is characterized by the appearance of two peaks of injury: on Thursday (16.2) and Sunday (13.4), when the traumatism of women becomes the greatest. As a rule, traumas occur in the summer (35.5) significantly exceeding the indices of autumn (28.0) and spring (23.7) periods. Single cases of damage were noted in the winter.

During flights, when extreme conditions are created on the ships: airborne, aft, or their combination, the transported is especially difficult; vessel's roll when the load is shifted; emergency situations and when staying in ports the frequency of occupational traumatism of women from the number of members of vessel's crew of the Northern Water's Basin does not change significantly (44.2 and 45.8, respectively). While with men when parking vessels at the mooring line accidents occur 1.6 times more often. This is due to a number of production

and social factors that do not affect the female part of the contingent of members of vessel's crew. Women practically do not participate in the most labor-intensive, low-mechanized, high risk of ship-borne work: mooring, loading; unloading; maintenance of machinery and deck machinery. In their social status, they are either alone, or from so-called incomplete families (they alone raise children), so they lack the factor of emotional stress of the upcoming meeting or separation from the family. And, finally, they do not consume alcohol, which is widely available for members of vessel's crew, especially when parking near the shoreline and is often a concomitant cause for traumatism on vessels.

When parking vessels at the port of registration, in a quiet occupational environment, women work confidently, do not violate technological processes and get traumas 1.7 times less often than men. At the same time, when parking in other ports, when the psycho-emotional strain of work joins in unfamiliar surroundings, the frequency of injuries among women increases by 1.4 times (20.8).

The extreme factors of swimming in high latitudes on the adapted female organism have less influence than on the male. In the northern latitudes, women receive occupational injuries two times less often than men and 2.7 times less than in the temperate climatic zone.

On the ships, women suffer heavier injuries: polytrauma in them constitute 19.8% of all injuries, while in men only 14.8%. The specific weight of certain types of damage is shown in table 1. Women with traumas on vessels in comparison with men are less likely to have bone fractures of different localization, but more often bruises and wounds.

Burns are the only type of damage that is significantly characteristic for women on water transport (16.2), they are found 2.2 times more often than men. If for men with damage on the ships there are burns from 1.0 to 3.0% of the body surface, women receive more severe burn injuries with a lesion area of 5.0–20.0%, mainly the shin, face, chest, forearm.

Localization of occupational traumas in women has a number of features compared to men. The brush is most often damaged (28.3). The proportion of various hand injuries in women (31.3%) is higher than that of men (27.4%). If traumas in men are characterized by fractures and bruises, in women brush traumas in 47.5% of cases were accompanied by her

wounds. Fractures of the bones or traumatic amputation of the phalanx of the fingers occur 2.3 times less often than the wounds (5.9). On the second ranked place there are traumas of the lower leg. In vessel's conditions, women basically get fractures of both her bones (7.5) and soft tissue injuries (3.1). With head injuries, women get bruises, closed craniocerebral trauma: brain concussions or fractures of the lower jaw. And injuries to the forearm lead to fractures of both his bones (10.3). They do not have shoulder injuries, while for men on water transport the usual dislocations in the shoulder joint are typical (38.6%), fractures of the humerus, detachments of the biceps tendons. Traumas of the chest are accompanied by her bruises, not complicated by injuries to the bones and organs of the chest cavity. Every second accident in women with spinal cord injury leads to fractures of the lumbar vertebrae. With injuries of the hip, knee, shin and foot, they have more bruises than wounds and fractures. Women from members of vessel's crew did not suffer from injuries to the neck, collarbone, abdominal cavity, which occur exclusively in men on ships.

The predominance of burns and wounds in the general structure of female traumas leads to the need for more frequent surgical treatment (31.1) of damages than for men. At the same time, other types of surgical interventions after traumas of women are 1.8 times less likely than men.

Traumas in women from the floating group are characterized by a favorable course. The number of complications in them is 4.4 times less ( $p < 0.001$ ).

At hospitalization in the surgical department, the duration of treatment is on average one less per day, and the period of incapacity for work is 18.4 working days. The outcomes with recovery are higher, and the death rate is 3.3 times less than in men.

## Discussion

The most common causes of women's disability in marine and river transport vessels of the Northern Water's Basin are accidents and injuries.

The variety of cargos are transported, the peculiarities of their loading, transportation and unloading lead to increased mental stress among the members of the deck crew and captains. Relatively short transits from port to port increase the number of mooring operations, which are among the least mechanized works. The high intensity of navigation on rivers, their narrow fairway, often created dangerous situations for traumatism on vessels. The constant presence of members of vessel's crew in the zone affected by the physical, chemical, psychological factors of the flight often leads to disruptions in the adaptive mechanisms of the organism, the appearance of pathological reactions that result of which occupational traumatism is [7].

The transport fleet is the main supplier of household goods for individual enterprises and settlements on the Northern Sea Route in the waters of the White, Barents and Kara Seas. In this regard, when swimming in the northern latitudes,

**Table 1:** The Structure of Traumatism in Women and Men from Members of Vessel's Crew on Transport Fleets in Types of Damage in % ( $P \pm m$ ).

Types of Damage	Women	Men
Fractures	32,1±1,5	40,3±0,8
Bruises	18,7±1,3	15,7±0,6
Wounds	18,7±1,3	15,4±0,6
Burns	18,7±1,3	4,8±0,5
Traumatic brain injuries	5,0±0,9	4,1±0,8
Traumatic amputations	5,0±0,9	6,2±0,7
Other types of damage	1,8±0,6	13,5±0,5
Total:	100,0	100,0

members of vessel's crew are affected by the entire complex of unfavorable climatic factors: low temperatures of the outside air, frequent gusty winds, often accompanied by rain, reduced visibility due to constant fogs, snow charges, snowstorms in the autumn-winter, icing of decks and vessel's hulls, the use of warm clothes slows down the speed of movement, violates the accuracy of the performed movements.

The main commodity is lumber, which requires particularly careful loading, perfect fixing of the deck cargo. In storm conditions, its displacement often occurs, and the ship loses stability. In summer, available for logging operations without ice protection, flights to the near and far Arctic, transport vessels transport cargo for the Norilsk Combine, pipes for the Siberian gas pipelines under construction, facilities for prospecting geological parties, flights to the lower reaches of the Ob and Yenisei rivers [8].

Often, from the polar ports vessels receive a voyage to deliver goods to Cuba or to the ports of the Mediterranean. Members of vessel's crew are subject to a rapid change in climatic conditions, time zones. Within 4-7 days the Arctic winter is replaced by a tropical summer with high temperatures and humidity.

Potentially dangerous occupational factors for the health of women from members of vessel's crew that increase the likelihood of the occurrence of diseases, their development and unfavorable outcome, directly or indirectly leading to the risk of injury are:

- 1) Emotional and intellectual stress;
- 2) A high degree of participation in the professional activities of the mental sphere;
- 3) Tensity of analyzer functions;
- 4) Monotony and the nature of work.

Additional risk factors should be considered:

- 1) Unfavorable working conditions;
- 2) Forced stay in a closed mainly male team;
- 3) Change of work with constant night watches;
- 4) Personal risk;
- 5) Responsibility for the safety of the vessel;
- 7) Adverse climatic conditions;
- 8) Family-household problems;
- 9) Separation from shore and family;
- 10) Low physical activity;
- 12) Low level of medical literacy;
- 13) Low level of medical (preventive) activity of the floating composition [9-11].

In long voyages the effect of meteorological factors (temperature, humidity, atmospheric pressure drops) and occupational hazards lead to different shifts in the health of the floating composition. Typical of them are:

- 1) A sensitive, shallow sleep, with frequent awakenings;
- 2) Appearance of various types of insomnia and lethargy after sleep;
- 3) Headaches;
- 4) Pain in the muscles, indirectly indicating a deterioration in the functional state of the nervous system;
- 5) Extension of the latent time of reactions to the sound, visual and temperature stimulus;
- 6) Decreased blood pressure;
- 7) Increased heart rate;
- 8) Change in intra cardiac conduction;
- 9) Increased concentration of sugar and blood cholesterol;
- 10) Changes in the content of Na + and Ca ++ in urine [12-16].

During the voyage, women are more likely to go to the vessel's doctor for micro damage of various etiologies. [17,18] Peculiarities of adaptation of the female organism to occupational conditions lead to specific features of the structure and nature of traumatism. Reliability of safe work of women decreases in extreme conditions of flights [19-22].

The prolonged stay of members of vessel's crew a voyage leads to the development of general fatigue, which increases the likelihood of injury. Women, when performing work assignments, tend to behave more cautiously than men, but this behavior should not be considered as gender-based injury prevention [23,24]. Therefore, the problem of prevention of female traumatism on vessels remains one of the most pressing issues of modern medicine on water transport [25-27].

Female occupational traumatism on sea and river transport vessels of the Northern Water's Basin are among the poorly studied problems. Its professional features are related to age, work experience and type of work performed.

Types of vessel's work performed by women on boats from cooks, bakers, barmaids, orderlies, sailors and skippers explain the nature of the injuries, which are in 2 times more often compared to men with sharp objects.

In a calm production environment, when vessels are stationed in their home port, women work more confidently, do not break technological processes and are less likely to get injured than men. When working in an unfamiliar environment, the reliability of female labor is reduced and approaches the level of traumas of men from the number of members of vessel's crew. [28-31].



Comparison of the results obtained with the results of other studies is not possible due to the lack of publications on the traumatism of women on the vessels of the transport fleet in accessible literature.

## Conclusion

In contrast to men in women with occupational injuries on vessels, bone fractures of different localization are much less common in comparison with, bruises and wounds. However, due to the specifics of the work performed, women receive, in comparison with men, more severe burn injuries with an area of damage of 5.0–20.0%, mainly the shin, face, chest, forearm.

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## Acknowledgements

I would like to thank Bychikhin N.P., Kucherenko V.Z., Zshuravlev S.M., Korotkich R.V., Lindenbraten A.L., Zabin Y.L., Novikov P.E., Achmeev V.N., Shumacher R.E., Orlov G.A., Dobrodeeva L.K., Klepikova R.A., Udalova L.S., Lus E.A., Kuznetsova M.N., Sidorov P.I., Sidorenkov O.K., Batygina N.I., Satybaldyev V.M., Popov V.A., Gljantsev S.P., Rzshevskaja V.N., Pjankov S.M., Pisarenko E.F., Anisimova A.V., Bubnov V.V., Popov O.A., Mozhsaev S.A., Galushev V.I. and all the anonymous reviewers for their important and useful comments.

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**Citation:** Shapovalov KA (2017) Features of Occupational Traumatism among Women from members of Vessel's Crew of transport fleet of the Northern Water's Basin. Ann Mar Sci 1(1): 039-044.